

What is claimed is:

1. A method for planarizing a surface of a wafer, comprising polishing the wafer in an electrolyte composition comprising a phosphate system having a pH from about 3 to about 10, wherein the wafer is connected to an electrical power source.
2. The method of claim 1, wherein the phosphate system comprises ammonium dihydrogen phosphate, diammonium hydrogen phosphate, or a mixture thereof.
3. The method of claim 2, wherein the electrolyte composition comprises about 2 to about 30 percent by weight of ammonium dihydrogen phosphate in volume of total solution.
4. The method of claim 2, wherein the electrolyte composition comprises about 2 to about 30 percent by weight of diammonium hydrogen phosphate in volume of total solution.
5. The method of claim 1, wherein the electrolyte composition comprises about 2 to about 30 percent by weight of the phosphate system in volume of total solution.
6. The method of claim 1, wherein the electrolyte composition further comprises one or more additives selected from the group consisting of benzotriazole, ammonium citrate, citric acid, and ammonia.
7. The method of claim 6, wherein the electrolyte composition further comprises one or more additives selected from the group consisting of tetraethylenepentamine, triethylenetetramine, diethylenetriamine, ethylenediamine, amino acids, ammonium oxalate, and ammonium succinate.
8. The method of claim 6, wherein the electrolyte composition comprises about 0.01 to about 2 percent by weight of benzotriazole in volume of total solution.

9. The method of claim 6, wherein the electrolyte composition comprises about 2 to about 15 percent of ammonium citrate by weight in volume of total solution.
10. The method of claim 7, wherein the electrolyte composition comprises about 0.01 to about 2 percent by weight of benzotriazole in volume of total solution and about 2 to about 15 percent by weight of ethylenediamine in volume of total solution.
11. The method of claim 1, further comprising removing copper atoms from the wafer.
12. A method for planarizing a surface of a wafer, comprising:
connecting the wafer to a positive terminal of an electrical power source;
disposing the wafer in an electrolyte composition comprising ammonium dihydrogen phosphate, diammonium hydrogen phosphate, or a mixture thereof; and
removing materials from the surface of the wafer disposed in the electrolyte composition.
13. The method of claim 12, wherein the electrolyte composition has a pH greater than about 3 and less than about 10.
14. The method of claim 12, wherein the electrolyte composition comprises about 2 to about 30 percent by weight of ammonium dihydrogen phosphate in volume of total solution.
15. The method of claim 12, wherein the electrolyte composition comprises about 2 to about 30 percent by weight of diammonium hydrogen phosphate in volume of total solution.
16. The method of claim 12, wherein the electrolyte composition further comprises one or more additives selected from the group consisting of benzotriazole, ammonium citrate, ethylenediamine, tetraethylenepentamine, triethylenetetramine,

diethylenetriamine, amino acids, ammonium oxalate, ammonia, ammonium succinate, and citric acid.

17. The method of claim 16, wherein the electrolyte composition comprises about 0.01 to about 2 percent of benzotriazole by weight in volume of total solution and about 2 to about 15 percent of ammonium citrate by weight in volume of total solution.

18. The method of claim 16, wherein the electrolyte composition comprises about 0.1 percent of benzotriazole and about 8 percent by weight of ammonium citrate by weight in volume of total solution.

19. The method of claim 16, wherein the electrolyte composition comprises about 0.01 to about 2 percent by weight of benzotriazole in volume of total solution and about 2 to about 15 percent by weight of ethylenediamine in volume of total solution.

20. A method for planarizing a surface of a wafer, comprising:
connecting the wafer to a positive terminal of an electrical power source;
disposing the wafer in an electrolyte composition comprising ammonium dihydrogen phosphate, benzotriazole, and ethylenediamine; and
removing materials from the surface of the wafer disposed in the electrolyte composition.

21. The method of claim 20, wherein the electrolyte composition comprises about 2 to about 30 percent by weight of ammonium dihydrogen phosphate in volume of total solution.

22. The method of claim 20, wherein the electrolyte composition further comprises about 2 to about 30 percent by weight of diammonium hydrogen phosphate in volume of total solution.

23. The method of claim 20, wherein the electrolyte composition comprises about 0.01 to about 2 percent of benzotriazole by weight in volume of total solution and about 2 to about 15 percent of ethylenediamine by weight in volume of total solution.

24. The method of claim 20, wherein the electrolyte composition has a pH greater than about 3 and less than about 10.

25. The method of claim 20, wherein the removed materials comprise copper.

26. A method for electrochemically polishing a wafer, comprising:
providing a wafer having metal atoms disposed on a surface thereof;
disposing the wafer in an electrolyte composition comprising ammonium dihydrogen phosphate, diammonium hydrogen phosphate, or a mixture thereof;
flowing the electrolyte composition through an ion exchange resin to remove the metal ions from the solution; and
recycling the electrolyte solution to the substrate.

27. The method of claim 26, wherein the electrolyte composition comprises about 2 to about 30 percent by weight of ammonium dihydrogen phosphate in volume of total solution.

28. The method of claim 26, wherein the electrolyte composition comprises about 2 to about 30 percent by weight of diammonium hydrogen phosphate in volume of total solution.

29. The method of claim 26, wherein the electrolyte composition has a pH greater than about 3 and less than about 10.

30. The method of claim 26, wherein the electrolyte composition further comprises one or more additives selected from the group consisting of benzotriazole, ammonium citrate, ethylenediamine, tetraethylenepentamine, triethylenetetramine,

diethylenetriamine, amino acids, ammonium oxalate, ammonia, ammonium succinate, and citric acid.

31. The method of claim 30, wherein the electrolyte composition comprises about 0.01 to about 2 percent of benzotriazole by weight in volume of total solution and about 2 to about 15 percent of ammonium citrate by weight in volume of total solution.

32. The method of claim 30, wherein the electrolyte composition comprises about 0.01 to about 2 percent of benzotriazole by weight in volume of total solution and about 2 to about 15 percent of ethylenediamine by weight in volume of total solution.

33. The method of claim 26, wherein the ion exchange resin comprises a chelating agent to remove dissolved metal ions from the electrolyte solution.

34. The method of claim 33, wherein the metal ions comprise copper.

35. An electrolyte composition, comprising about 2 to about 23 percent by weight of ammonium dihydrogen phosphate, diammonium hydrogen phosphate, or a mixture thereof in volume of total solution.

36. The electrolyte composition of claim 35, wherein the electrolyte composition further comprises one or more additives selected from the group consisting of benzotriazole, ammonium citrate, ethylenediamine, tetraethylenepentamine, triethylenetetramine, diethylenetriamine, amino acids, ammonium oxalate, ammonia, ammonium succinate, and citric acid.

37. The electrolyte composition of claim 36, wherein the electrolyte composition comprises about 0.01 to about 0.5 percent of benzotriazole by weight in volume of total solution and about 2 to about 15 percent of ammonium citrate by weight in volume of total solution.

38. The composition of claim 36, wherein the electrolyte composition comprises about 0.01 to about 2 percent of benzotriazole by weight in volume of total solution and about 2 to about 15 percent of ethylenediamine by weight in volume of total solution.

39. A method for planarizing a surface of a wafer, comprising polishing the wafer in an electrolyte composition comprising a phosphate system, wherein the wafer is connected to an electrical power source.

40. The method of claim 39, wherein the phosphate system comprises ammonium dihydrogen phosphate, diammonium hydrogen phosphate, or a mixture thereof.

41. A method for planarizing a surface of a wafer, comprising:
connecting the wafer to a positive terminal of an electrical power source;
disposing the wafer in an electrolyte composition comprising a phosphate system;
and
removing materials from the surface of the wafer disposed in the electrolyte composition.

42. The method of claim 41, wherein the electrolyte composition comprises one or more additives selected from the group consisting of benzotriazole, ammonium citrate, ethylenediamine, tetraethylenepentamine, triethylenetetramine, diethylenetriamine, amino acids, ammonium oxalate, ammonia, ammonium succinate, and citric acid.

43. A method for electrochemically polishing a wafer, comprising:
providing a wafer having metal atoms disposed on a surface thereof;
disposing the wafer in an electrolyte composition;
flowing the electrolyte composition through an ion exchange resin to remove the metal ions from the solution; and
recycling the electrolyte solution to the substrate.